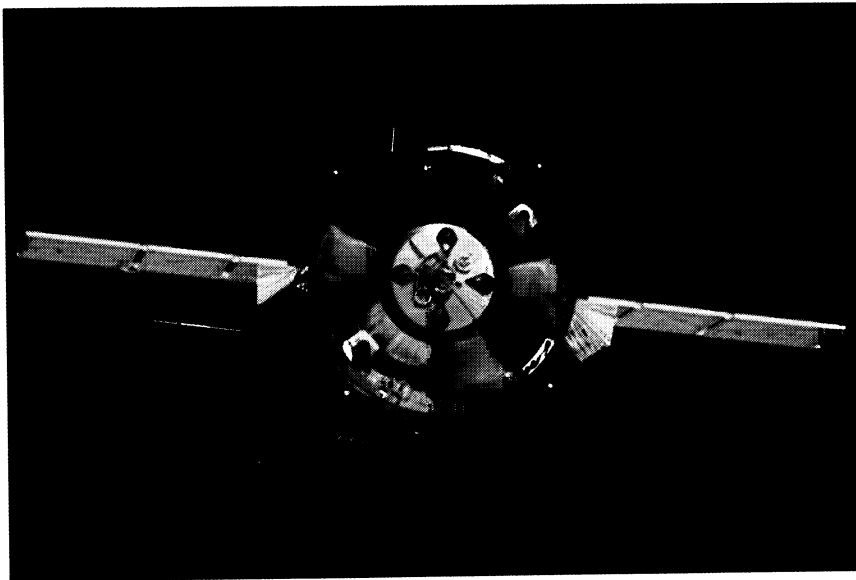


Breaking the Language Barrier

Heading a group of technology transfers in the field of computer processing is a space-spurred electronic translation system



In the summer of 1975, an American Apollo and a Soviet Soyuz spacecraft docked in orbit, the first international space linkup. The mission—which proved highly successful—was intended as a first step in development of internationally compatible equipment and techniques, toward the day when spacecraft of any nation could dock together for operational or rescue purposes.

Apollo-Soyuz was a complex project that needed three years of preparation for study of the many Soviet/American differences in design and operational techniques, and for joint development of an airlock to allow the crews to move from one spacecraft to the other. For

The spacecraft pictured is a Soviet Soyuz, photographed by an American Apollo crew as the two craft maneuvered toward a historic docking in orbit. Preparations for the mission entailed large-scale informational exchange, accomplished by a computerized translation system. Apollo-Soyuz thus provided impetus to development of a commercial machine translation system known as SYSTRAN II.

the benefit of astronauts, cosmonauts, scientists, engineers and ground controllers, each nation provided the other a voluminous library of technical literature—written, of course, in the language

of origin. That posed a first class dilemma; there probably were not enough technically qualified translators in the world to convert the material from one language to the other in the allotted time.

Johnson Space Center (JSC) found a solution in the person of Dr. Peter Toma, president of LATSEC, Inc. and the World Translation Center, La Jolla, California. A pioneer in computerized language translation, Dr. Toma had earlier developed a basic software package—called SYSTRAN—and worked on a Russian-to-German translation system. He had also developed, for the U.S. Air Force, software for translating Russian into English.

Under JSC contract, Dr. Toma undertook development of a two-way software package—Russian to English and English to Russian—for Apollo-Soyuz. For the Russian to English translations, he was able to draw on the technology he had developed for the Air Force. Converting English to Russian, however, presented a formidable challenge. Russian is a “fully-inflected” language wherein word meanings are altered, in precise fashion, by the addition of prefixes, infixes and suffixes; parts of speech and the relationships between adjectives and the nouns they modify are virtually always clear. English is much more subtle; the meaning of a statement is influenced by the parts of a sentence preceding or following a particular word or phrase. Many

language experts had predicted that machine translations from English would be next to impossible.

Dr. Toma proved them wrong. His two-way Apollo-Soyuz software package was highly satisfactory and it contributed substantially to the success of the mission. His breakthrough in translating English to a fully-inflected language, coupled with the demonstration of software reliability in a large-scale project, spurred commercialization of machine translation.

One of Dr. Toma's first commercial customers was Xerox Corporation, Rochester, New York. Xerox markets its products internationally, thus needs translation of service manuals into several languages. Seeking to improve its competitive posture by reducing translation and printing time, Xerox contracted with Dr. Toma's World Translation Center for translation software. The company is currently making translations from English into French, Spanish, Italian and Portuguese and is planning expansion into other languages.

In 1976, Dr. Toma licensed World Translation Company of Canada (WTCC) Limited, Ottawa, Ontario to handle North American marketing and commercial support activities for

SYSTRAN II "reads" a document in one language and produces a printout in the target language. Using a computer terminal, a human translator (below) refines the printout. The end product is a translated and edited magnetic tape ready for printing.

the SYSTRAN system. WTCC was formed by a group of Canadian investors who saw a broad market for electronic translation in growing corporate multinationalism and in Canada's Official Languages Act, which requires publication of government and other documents in both French and English. Dr. Toma and WTCC still work together; the result of their collaboration is SYSTRAN II.

The key element of SYSTRAN II is a computer program—one of the longest ever written, with half a million lines of instructions—backed by a computerized dictionary which contains terminology, technical expressions, grammatical rules and semantic principles. The text to be translated is fed into the computer, which analyzes it for syntax and semantics, then produces—in printout form—an accurate version of the text in the target language. The computer's draft is refined by human translators, whose editing is also computerized. The system then produces a magnetic tape ready for photocomposition.

WTCC says that SYSTRAN II will generally increase the output of a human translator by five to eight times, thus affording significant cost savings by allowing a large increase in document production without hiring additional people. Extra savings accrue from automatic production of camera-ready copy.

SYSTRAN II applications include translation of service manuals, proposals and tenders, planning studies, catalogs, lists of parts and prices, textbooks, technical reports and education/training materials. The

system is operational for six language pairs. In addition to Russian/English and English/Russian, they include translations from English to French, Spanish and Italian and from French to English. Six other pairs—English to German, Portuguese and Arabic, German to English, French and Spanish—have been successfully demonstrated and are being improved. Japanese to English and English to Japanese are in process of development.

Xerox Corporation's experience exemplifies the system's utility. Xerox, which has a 10-person translation group and a high annual volume of manual production, finds that its machine translations take only 20 percent of the time otherwise required, even with allowance for the time spent on human editing of the computer's draft. There is an additional saving in formatting time; the translated readout retains the indentations, paragraphing and other features of the input copy, hence—after editing—is ready for printing. In addition to Xerox, other major SYSTRAN users include General Motors of Canada, Bell Northern Research of Canada, the U.S. Air Force and the European Commission.

At the University of Petroleum and Minerals in Saudi Arabia, David Burden (right), senior vice president of World Translation Company of Canada, demonstrates how SYSTRAN II can translate English language material into Arabic with accuracy, consistency and appreciable cost savings.

